The brightening splenium: An imaging hallmark of dengue encephalopathy?

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Ann Indian Acad Neurol 2016;19:516-517

Clinical Cases

Six patients (five males and one female), aged 14–40 years, presented with a prodrome of fever, headache, and myalgia (duration: 1–4 days) followed by altered sensorium with no accompanying seizures or focal deficit. Dengue NS1 antigen assay confirmed the diagnosis of dengue in all cases. None of the patients had features of dengue shock syndrome, dyselectrolytemia, hepatic encephalopathy, or hypotension. Mild elevation of transaminases was noted in four patients. Cerebrospinal fluid (CSF) examination performed in two patients showed lymphocytes (0–5) with normal protein and sugar. Diffusion-weighted imaging of the brain showed splenic hyperintensities ranging from very subtle restriction to classical patterns of "dot sign" or "boomerang sign" [Figure 1]. Dot sign refers to a small, well-defined oval lesion in the midline within the substance of the corpus callosum while a more extensive ill-defined, irregular lesion extending throughout the splenium and at times even into the adjacent hemispheres is termed as "boomerang sign." The other patients who had signal alteration approaching these descriptions were considered to have an early or expanding dot/boomerang sign. All these patients had a complete functional recovery over a period of 5–7 days without any residual neurological deficit. Features of disconnection syndrome or left-hand apraxia were conspicuously absent.

Discussion

Dengue virus has now become a major challenge to the healthcare system of our country, especially with the recent epidemics. Even on a global scale, the infection rate has reached alarming proportions with 50–100 million reported cases and 25,000 fatalities every year. Traditionally, this RNA virus of the family *Flaviviridae* was considered as a nonneurotropic virus which does not insinuate itself into the brain parenchyma or the meninges. The predominant neurological presentation of altered sensorium with or without seizures, commonly referred to as dengue encephalopathy is attributed to multiple factors such as hepatic encephalopathy, dyselectrolytemia, cerebral hypoperfusion, and cerebral edema. This clinical picture can be seen in 0.5–6.2% cases as reported by various authors.[1,2] However, many recent reports have attempted to establish possible true encephalitis with radiological and/or clinical features supporting neuroinvasion. The isolation of the virus and antidengue antibodies in the CSF unequivocally negates the assumption that the virus is nonneurotropic, but the mechanisms of injury and their association with the clinical patterns need to be studied extensively.[3] Imaging abnormalities as described in the literature are seen in a small proportion of patients with dengue encephalopathy. Misra *et al*., who analyzed 17 patients with neurological complications of dengue in whom nine patients had undergone neuroimaging, found a radiological abnormality in the form of hyperintensity of the globus pallidus only in a single patient.[4] Of late, Mathew *et al*. have drawn attention to transient splenial hyperintensities (TSH) as a feature of dengue encephalitis.[5,6] This finding can be seen in a host of conditions both systemic and neurological as an evanescent finding of questionable clinical significance. The key factors responsible

Access this article online	
Quick Response Code:	Website: www.annalsofian.org
	DOI: 10.4103/0972-2327.192385

How to cite this article: Sureshbabu S, Khanna L, Peter S, Patras E, Mittal GK. The brightening splenium: An imaging hallmark of dengue encephalopathy?. Ann Indian Acad Neurol 2016;19:516-7.
Received: 30-01-16, **Revised:** 20-03-16, **Accepted:** 09-04-16

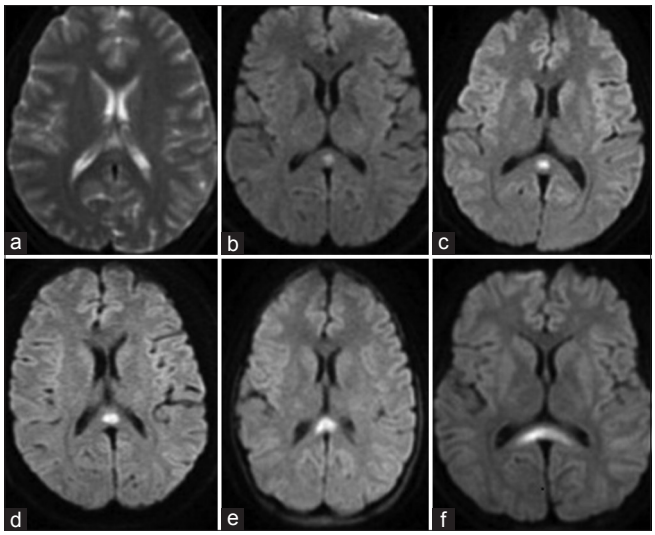

Figure 1: 1.5 T Magnetic resonance imaging of the brain showing varying degrees of diffusion restriction in the splenium of corpus callosum. (a) Subtle diffusion restriction, (b) early dot sign, (c) classic dot sign, (d) expanding dot sign, (e) early boomerang sign, (f) classic boomerang sign

for TSH in dengue encephalopathy could be a breach of the blood–brain barrier and osmotic and inflammatory injury leading to intramyelinic edema or microvascular leak. Although ubiquitous, a discussion on this radiological pattern is warranted due to a few pertinent reasons: (1) To ascertain the prognostic value of this finding specific to the context of dengue encephalopathy/encephalitis, (2) an awareness of this finding will dissuade the treating physician and radiologist from futile investigations, (3) to describe the full spectrum of splenial diffusion abnormalities ranging from a subtle whitening to a widespread restriction (the boomerang sign). That is what this article has attempted to highlight. Diffusion restriction outside the splenium can rarely be encountered in patients with dengue. The peripheral pattern of restriction in the pons described by Mehta A as "the reverse mustache sign" is one such example.[7] All our patients had a transient encephalopathy which improved with supportive care, and no correlation was observed between the degree of diffusion restriction and clinical course. The detailed neurological examination did not reveal any residual clinical evidence of callosal involvement.[8] The range of abnormalities which we have observed [Figure 1] is presented in an illustrative manner. The absence of other abnormalities such as thalamic or hippocampus involvement and significant CSF pleocytosis makes it apparent that syndromically, these presentations classify as encephalopathy rather than encephalitis based on available evidence. However, CSF could not be done in four of the six patients in whom the latter possibility cannot be ruled out.

Acknowledgments

We acknowledge the Director of St. Stephen's Hospital and the hospital management for allowing us to publish this work.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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